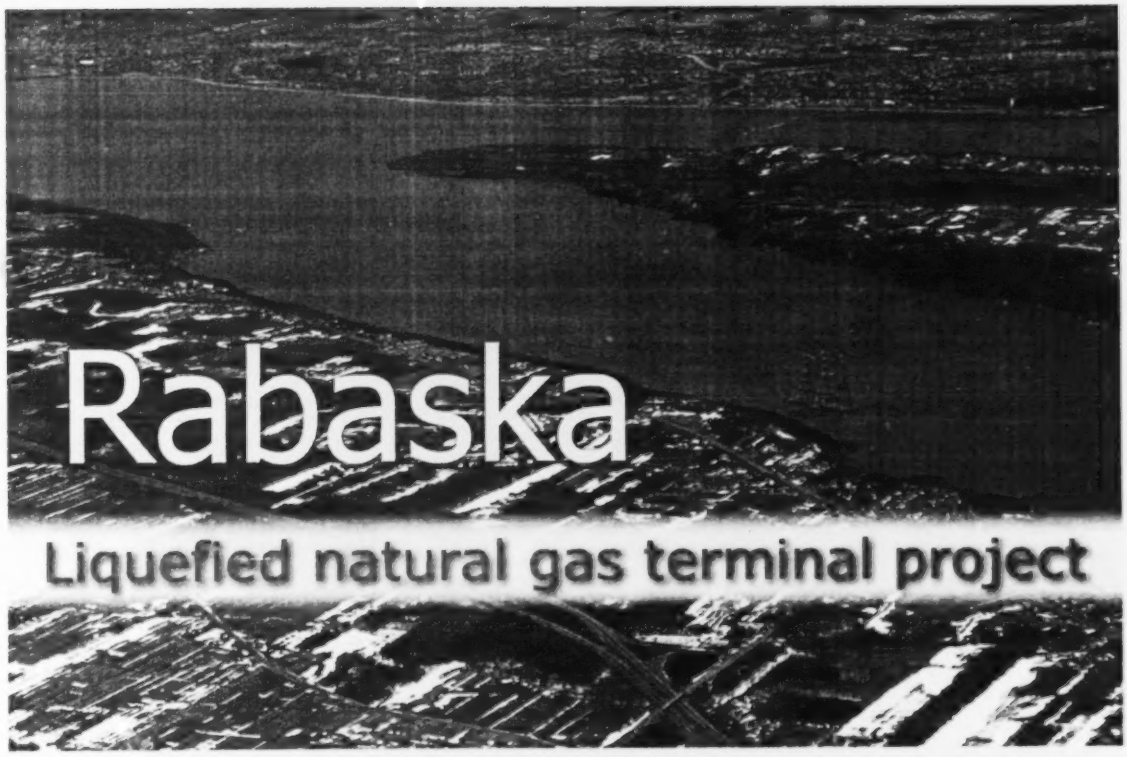
Transport Canada Transports Canada

TP 14684E

TERMPOL Review Report



Final Report
May 15, 2007

Canada

FOREWORD

The Rabaska Project consists of the implementation of a terminal for the importation of liquefied natural gas (LNG) at Lévis, Quebec. The proponent is a corporation called Rabaska, a limited partnership composed of Gaz Métro, Enbridge and Gaz de France.

The TERMPOL[1] review process (TRP) was initiated at the proponent's request, as stipulated in the TERMPOL code.[2] Further to this request, a TERMPOL Review Committee (TRC),[3] made up of representatives of various federal and provincial departments and agencies as well as specialized consultants, was established to study the proponent's proposal. It is the responsibility of the TRC to assess the risks to navigation and public safety that could be incurred by locating and operating an LNG terminal at Lévis. The TRC is mandated to analyze the impact of marine operations only. Within the framework of the TRP, the TRC asked the proponent to produce studies pertaining to the safety of ships involved and the dangers that their presence, manoeuvres and operations could represent to navigation and the environment under all foreseeable weather conditions.

The TRC report outlines the methodology used, exposes some concerns and lists the recommendations made. The TRC[4] remains available to give any clarifications relating to this report.

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[1] "The TERMPOL Review Process (TRP)" refers to the Technical Review Process of Marine Terminal Systems and Transshipment Sites. See bibliography.
[2] TP 743, section 1.6.1.
[3] Appendix I, TERMPOL Review Committee Members.
[4] Through Transport Canada Marine Safety.

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LIST OF ABBREVIATIONS

ABBREVIATION	FULL NAME
CCG	Canadian Coast Guard
CEAA	*Canadian Environmental Assessment Act*
CHS	Canadian Hydrographic Service
CLSLP	Corporation of the Lower St. Lawrence Pilots
CSA	*Canada Shipping Act*
EC	Environment Canada
LNG	Liquefied natural gas
LPA	Laurentian Pilotage Authority
MCTS	Marine Communications and Traffic Services, Fisheries and Oceans Canada, CCG
NWPA	*Navigable Waters Protection Act*
QPA	Quebec Port Authority
TCMS	Transport Canada Marine Safety
TC- NWPA	Transport Canada Navigable Waters Protection Act
TERMPOL	Technical Review of Marine Terminal Systems and Transhipment
TRC	TERMPOL Review Committee
TRP	TERMPOL Review Process
TP 743	Transport Canada Publication entitled *TERMPOL Review Process 2001*

INTRODUCTION

The Rabaska project consists of establishing a terminal for the importation of LNG at Lévis. The TRP was initiated at the proponent's request, as stipulated in the TERMPOL code. A TRC was formed to analyze this project.[5]

The TRP is an analysis process designed to assess the risks to navigation and public safety that could be incurred by locating and operating marine terminals. Other concerns relevant to the activities of an LNG importation and storage site are the responsibility of the government authorities of competent jurisdiction, within the limits of enforcement of their respective acts, regulations and bylaws.

The TRP analyzes the design ship's[6] selected route in waters under Canadian jurisdiction to its berth at the proposed marine terminal and, specifically, the process of cargo handling between ship and shore. This TRP applies to the specialized equipment required at the liquefied gas terminals, the proposed LNG transhipment facilities, the operating procedures and any planned changes to existing terminals.

The intent of the TRP is to improve the elements of a project that, as presented by the proponent, could, under certain specific circumstances, threaten the integrity of a ship's hull, its cargo containment system and, consequently, the environment in the vicinity of the design ship while it is navigating in waters under Canadian jurisdiction or engaged in cargo transfer operations alongside the proposed terminal. Particular attention is paid in the TRP to operational safety measures in site-specific circumstances and along the associated navigational routes.

The TRP does not apply to the actual construction of the terminal, nor is it intended to assess the terminal's on-land facilities and installations. Nevertheless, the TRP addresses several specific aspects of the jetty, such as the terminal wharf structure, mooring equipment specification and aspects of the terminal's operation and emergency response planning applicable to design ships that

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[5] Appendix II, Key Stages of TERMPOL Review Process.
[6] Appendix III, Design Ship.

will be using the terminal. This inclusion of terrestrial elements in the vicinity of the berth is minimal but necessary in order to take all safety considerations into account. Moreover, since the Rabaska Project is subject to the *Canadian Environment Assessment Act* (CEEA) regulatory processes, the TRC has left the assessment of certain aspects, such as the impact on fishery resources, to the authorities concerned.

The TRP does not prescribe detailed standards for the sitting, design, construction and operation of the marine terminal and transportation systems. The TRP is not meant to replace the requirements of the environmental impact assessment process required under the CEAA or the process to assess the impact of the LNG terminal on navigation pursuant to the *Navigable Waters Protection Act* (NWPA)[7]. Nor does the TRP replace the safety, security and environmental requirements of any other acts and regulations that are in effect.

The TRP is not a process for the approval or rejection of a specific project. The proponent must obtain any such approvals from the appropriate regulatory authorities, in accordance with their own specific processes.

The TRP is used to analyze a project in order to determine its potential impact on the existing regional navigation system and to propose, if necessary, measures to mitigate that impact or to improve the safety of LNG carriers and operations at the marine terminal. The different projects submitted to a TRP are reviewed distinctly ones of the others. However, similar aspects are addressed equally and can lead to similar mitigation and improvement projects.

[7] The NWPA process makes sure the port installations, buoys, signalisation and other marine safety elements do not impede the navigable rights of other users.

METHODOLOGY

Rabaska submitted the documentation structured in accordance with the sixteen TERMPOL code studies retained by the TRC.[8] The studies were grouped into five volumes, based on specific subjects on safety and the environment, the wharf, navigation and ships' specification.

Three studies described in Part 3 of the TERMPOL Code[9] were not required by the TRC because their scope did not specifically apply to the Rabaska project. They are:

- Single-point mooring provisions and procedures;
- Oil handling facilities requirements; and
- Hazardous and noxious liquid substances.

The purpose of the TRC's work is not to approve the studies presented by the proponents, but rather to use their content to review the project and draft its report.

In TP 743, the purpose of each study is clearly specified.[10] However, surveys 3.2 on the origins, destinations and marine traffic volume and 3.4 on offshore exercise and offshore exploration and exploitation activities were not used to determine the optimum route in terms of navigational safety as set out in TP 743, as the LNG carriers will follow established navigation routes. As such, surveys 3.2 and 3.4 are more to support study 3.15 on general risk analysis and intended methods of reducing risks submitted by Rabaska.

The contents of the studies provided by the proponent were examined and the TRC verified whether data and information presented in these studies met its needs. Discussions between the proponent and the TRC took place from the time the first studies were submitted until the final report was produced in order to provide clarification and make any necessary changes to the project. The TRC documentation and research work includes the examination of international standards and regulations, participation in specialized training on LNG marine transportation and visits to LNG

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[8] Appendix IV, Surveys and Studies used by the TRC.
[9] TP 743 e, TERMPOL Review Process, Part 3, paragraphs 3.14, 3.19 and 3.20.
[10] TP 743 e, TERMPOL Review Process, Part 3, paragraphs 3.2 to 3.20.

terminals and carriers in operation. Select committee meetings were held, discussions were conducted by electronic mail and internal consultations were carried out, as required, within certain organizations. The consequences and impact of LNG carrier traffic were assessed in light of the studies submitted, the documentation consulted, the information gathered and the existing situation. Following this assessment, the TRC proposed recommendations to the various stakeholders. Some recommendations are aimed at ensuring the implementation of the measures proposed by the proponent, while others are intended to improve certain elements of the project. In the expert view of the various TRC members, the implementation of these recommendations would reduce the risks and threats to the integrity of ship hulls and their cargo containment systems and, consequently, to public safety and the environment.

As marine operations and their context may evolve and change over the terminal's years of operation, Transport Canada Marine Safety (TCMS), jointly with federal and provincial departments and agencies involved in the TRP, could review operating standards with Rabaska at any time.

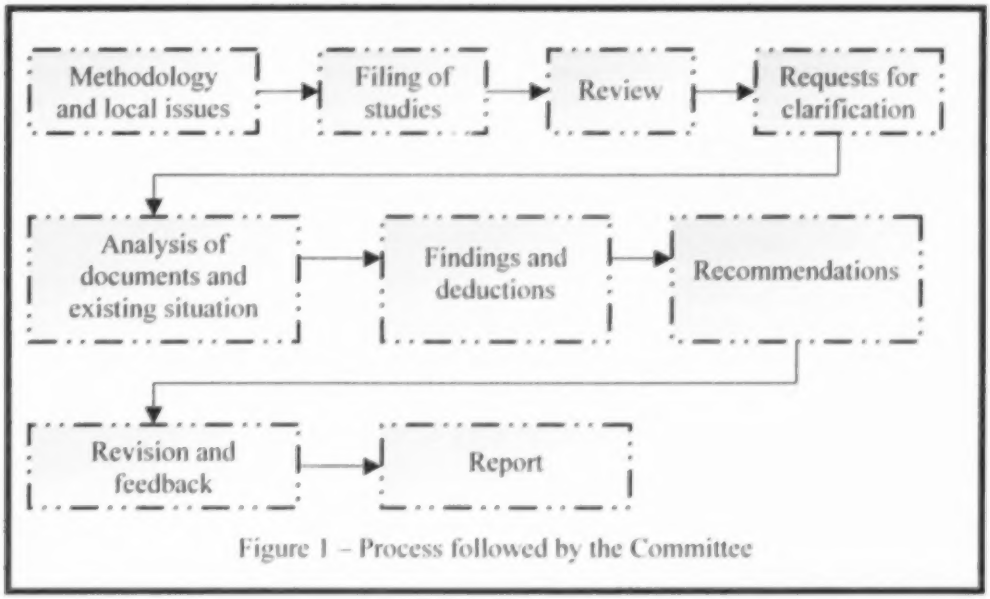

Figure 1 – Process followed by the Committee

PROJECT – SPECIFIC CONCERNS

Safety zone around a ship in transit

The Committee sees no justification at this time for establishing safety zones[11] around ships in transit. The Committee considers that the *Collision Regulations*, the existing marine traffic organization and communications systems, and the compulsory pilotage area are sufficient tools for ensuring navigational safety.

Safety zone around a ship at anchor

Under *Routing Standards* (TP 1802), a safety zone may be required for safety reasons or to protect the environment. Taking this concern into account in the present context and since LNG carriers will use anchorage as an exception, the TRC sees no justification at this time for creating a safety zone around a ship at anchor. Further, if this situation arises, a safety notice to shipping could be broadcasted, on marine radio, in order to notify ships[12].

Marine security

The TRC considered the questions pertaining to deliberate acts against LNG carriers and terminals that might have repercussions on safety, the environment and property. In Canada, the *Marine Transportation Security Act* and the *Marine Transportation Security Regulations* govern these concerns. Under the terms of these regulations, LNG carriers and terminals must have an **approved security plan**. These plans are developed in light of vulnerable elements identified at the time of assessment of operations and installations. They put in place means for reducing risks and countering threats. Such means are adapted to match the identified threat level. Since the measures to protect against such acts are already governed by a sufficient regulatory framework, the TRC felt there was no need to make specific recommendations with regard to such measures. In addition, it should be noted that authorities evaluate threats continuously. Presently, these authorities have informed the Committee that there is nothing to indicate a need for additional measures for LNG carriers because they consider the regulatory measures already in place sufficient to counter such acts.

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[11] As defined in TP 1802, *Routing Standards*.
[12] See Recommendations 11 and 12.

Management of exceptional events

Exceptional events, such as damage at sea, collisions, groundings or equipment failures, that could occur to LNG carriers in Canadian waters raised concerns among the various parties at the time of the Rabaska project examination. Such exceptional events involving ships are presently managed by a well-established set of procedures involving many government departments and agencies. The TRC analyzed the possibility of LNG carrier involvement in such events. For its analysis, the TRC requested additional information from the proponents, namely specific information on refloating an LNG carrier in the event of grounding. The TRC consider that the recovery measures developed by the proponent and the existing mechanisms are appropriate for addressing these situations.

Winter navigation

The severe navigation conditions prevailing in winter in the Gulf of St. Lawrence and the St. Lawrence River call for special measures to ensure navigation safety. Not only does the presence of ice present additional challenges, adjustments must also be made when navigating in cold weather.

In the studies submitted to the TRC[13], the proponent indicates that LNG carriers that will use the terminal during winter will be designed based on the devices contained in the following documents:

- TP 14335 *Winter Navigation on the River and Gulf of St. Lawrence - Practical Notebook for Marine Engineers and Deck Officers*; and
- Canadian Coast Guard publication, *Ice Navigation In Canadian Waters*.

Among other things, these publications expose recurrent problems encountered in the winter by ships sailing in the St. Lawrence and suggest possible solutions to overcome them.

To that effect, the Committee encourages the proponent to adopt the appropriate practices and measures presented by several maritime administrations or organizations and classification societies that are recognized for protecting ships, their equipment and crews against the impacts of cold weather navigation.

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[13] Measures proposed in Survey 3.9 – Ship Specification and Survey 3.5 – Route Analysis, Approach Characteristics and Navigability Survey.

The TRC also proposes that Rabaska put in place a control procedure to ensure that spot-chartered vessels meet the same winter safety and operating standards as permanently chartered vessels.

Furthermore, information on cold-weather operations and ship handling in ice should be part of the crew's training plan and be integrated into the manuals of the LNG carriers bound for the terminal.

Breach in the cargo tanks

During its review, the TRC did not identify marine navigation accidents involving LNG carriers that resulted in a cargo spill.

Marine experts are of the opinion that an impact must be major to damage the cargo containment system, which is located approximately 3 metres in from the outer hull of the ship. Upon assessment following a collision on the tank area, an LNG carrier could potentially lose part of its cargo if all appropriate speed, tonnage and collision angle factors were to occur at the same time.

Experts also recognize high-speed grounding of an LNG carrier on a hard and uneven bottom as a scenario that could result in the loss of cargo containment system integrity. However, two groundings of LNG carriers at speeds of approximately 12 and 17 knots were noted among the marine navigation accidents recorded, one of which occurred when a ship struck rock. There was no loss of cargo resulting from these groundings.

The TRC formulated certain recommendations to prevent incidents that could result in considerable damage to LNG carrier cargo tanks from occurring while ships are close to populated coastal areas.

Transit near the Saguenay River

The passage north of Île Rouge is the direct and usual passage used by ships sailing to and from Quebec. At this location, upbound and downbound vessels meet in parallel and the passage is of sufficient width for ships to take evasive action. The Committee is in favour of LNG carriers following the same transit practices as established for this area. Determining the best passage, whether to the north or south of Île Rouge, is left up to the bridge team based on the situation and information transmitted by the Marine Communications and Traffic Services (MCTS).

LNG carriers transiting north of Île Rouge might meet a ship proceeding outbound the Saguenay River. Considering the number of ships transiting the Saguenay River, chances for this situation to occur are rather low. Furthermore, a mandatory MCTS calling-in point, located at the entrance of the Saguenay River (Prince Shoal), requires a reporting action from vessels transiting in the vicinity. MCTS will therefore transmit the relevant information to the ship traffic in the vicinity. It is already a standard practice for CLSLP pilots to avoid crossing situations with ship proceeding outbound the Saguenay River. However, should such situation arise, the meeting would be held far from shore and be easily avoided considering the width of the navigable waterway in this area. Consequently, the TRC is of the opinion that it is not justified to impose additional mitigation measures.

Ferries

The Committee considers that it is unnecessary to implement additional risk mitigation measures for crossing ferries as the *Collision Regulations* prescribe the measures to take in a crossing situation. Furthermore, the Regulations state that to the west of Île Rouge, a vessel crossing a river shall keep out of the way of a vessel ascending or descending the river. Interactions between ferries and other vessels are therefore already regulated.

Chenal du Nord

The passage between Pointe d'Alliance and Saint-Jean, Île d'Orléans[14], is a location where the strait is narrow. It extends approximately 16 nautical miles and is marked out with buoys and range lights. The guaranteed minimum depth indicated on the nautical chart is 12.5 m for a width of 305 m. To analyze the passage of LNG carriers in this reach and to draft its recommendations[15], the TRC took into consideration risk mitigation measures proposed by the proponent and considered the following elements:

- one-way navigation when the channel width is less than seven times the ship's breadth;[16]
- windage area of the LNG carrier (surface exposed to wind);
- drift angle, resulting from the wind and current, that can reduce the amount of navigable space for ships approaching each other;
- presence of ice;

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[14] See the nautical charts at Appendix IX and X.
[15] Recommendations: 15, 16, 17, 19, 20, 21, 25 and 26.
[16] Subsection 1.4 of Appendix 2 of the TERMPOL Code.

- presence of deep-draught vessels that must coordinate their passage with an accurate tidal window in order to obtain a sufficient underkeel clearance;
- ship's squat;
- reduction of the risk and impact of grounding; and
- the proximity of populated coastal areas.

Training

Since the shipping of LNG by sea would be a new market in eastern Canada, the TRC identified a need for training stakeholders who would gravitate to this sector, and certain recommendations of this report reflect this concern.

Some organizations already have training programs that are specific to their activities. Among others, there is a continuing education program for pilots of the Corporation of the Lower St. Lawrence Pilots (CLSLP), the content of which is approved by the Laurentian Pilotage Authority (LPA). The TRC suggests that the following training be included in this program before the terminal goes into operation:

- Training for all pilots assigned to LNG carriers on the various aspects of cryogenic cargo transportation and handling as well as on emergency response actions;
- Training on manoeuvre techniques with tug escort in indirect mode; and
- Manoeuvre training adapted to LNG carriers and the Lévis terminal for docking pilots.

RECOMMENDATIONS

The following recommendations are intended to ensure or improve the safety of navigation and operations at the terminal facilities.

The purpose of the recommendations in this report that refer to passages and manoeuvres is not to restrict the bridge team in its freedom to adapt the voyage plan based on the circumstances and their experience. When a vessel transits in a mandatory pilotage area, it's important to understand that the bridge team develops a voyage plan and that this plan is tailored to the ship's specifications, its ability to manoeuvre, its draught and its air draught. For a given vessel, the plan is adjusted to take into account the loading condition, the point in the tide cycle, the weather conditions, the ice conditions, the traffic density and the characteristics of nearby vessels.

When norms, standards or other publications are mentioned, the TRC is referring to the most recent versions of these documents.

General recommendations

1. The Committee recommends that Rabaska make available at all times, at the request of TCMS or Environment Canada (EC), all manuals and documents[17] pertaining to ships and transhipment facilities in order to check the compliance of equipment and operations.

2. The Committee recommends that Rabaska establish a process for periodic meetings with TCMS and the organizations concerned in order to assess and demonstrate that safety measures and procedures related to ship and terminal operations are being followed and appropriate. Such meetings should be held at least once every year.

3. The Committee recommends that Rabaska submit to TCMS for review any proposed change to marine operations and also to the Quebec Port Authority (QPA) when changes are within Port boundaries.

[17] Manuals, record books, procedures, plans, etc. should be presented during on-site inspections. Copies of these documents should be supplied to authorities as and when required.

4. The Committee recommends that Rabaska submit to TCMS for review, at least six months prior to the arrival of the first ship, all procedures and information being the subject of the following recommendations:
    - Ice adviser competency (recommendation 9);
    - Weather, ice and glazed frost conditions (recommendations 26 and 27);
    - Ship handling simulations (recommendation 31);
    - Tugs (recommendation 39);
    - LNG carrier specifications (recommendation 45);
    - Bathymetric surveys (recommendation 46); and
    - Conducting of the compliance audit (recommendation 56).

5. To avoid any confusion during berthing manoeuvres or transhipment operations, the Committee recommends that Rabaska establish appropriate measures to ensure that communications are carried on in a common language. This policy concerns communications between personnel on tugs and LNG carriers and at the terminal.

Routes, approaches and navigability

6. The Committee recommends that TCMS, in conjunction with the CCG, establish procedures to authorize, if necessary, the use of appropriate places for refuge for LNG carriers in need of assistance.

7. The Committee recommends that Rabaska implement its proposal to make use of ice advisers for the transit in winter conditions of LNG carriers between the Cabot Strait and Les Escoumins.

8. The Committee recommends that Rabaska implement procedures for the boarding of ice advisers for each of the sites identified and that they validate them with local authorities.

9. The Committee recommends that Rabaska establish a procedure to ensure that the competency of the ice adviser on board the LNG carrier complies at least with the competency requirements laid down in the JIGS[18].

10. The Committee recommends that Rabaska and the CLSLP establish a procedure so the approach of the LNG carrier into the pilot boarding and disembarking area in the Les Escoumins station[19] is done within the following parameters:
    - no other ship may be in the boarding area at the same time as an LNG carrier; and
    - the LNG carrier remain more than one nautical mile from the shore. However, MCTS officers or pilots may also require a greater distance based on their assessment of the situation at the time the LNG carrier approaches.

11. The Committee recommends that Rabaska establish procedures so that passages of LNG carriers in Canadian waters are made in accordance with planned routes and without stops.

12. The Committee recommends that the MCTS establish a procedure to notify TCMS as soon as an LNG carrier deviates from its voyage plan.

13. The Committee recommends that TCMS, in conjunction with the CCG, determine the criteria for the selection and use of potential anchorage areas for LNG carriers and establish procedures to allow their use.

14. The Committee recommends that Rabaska and the CLSLP establish a procedure so that the passage of an LNG carrier near Île-aux-Coudres be planned to avoid vessels meeting and overtaking in the section of the waterway located between longitude 70° 23' W (Saint-Bernard, Île-aux-Coudres) and latitude 47° 23'N (Cap-à-la-Branche).[20]

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[18] JIGS : Joint Industry Coast Guard Guidelines for the Control of Oil Tankers and Bulk Chemical Carriers in Ice Control Zones of Eastern Canada.
[19] See the Nautical chart at Appendix VII.
[20] See the Nautical chart at Appendix VIII.

15. The Committee recommends that Rabaska and the CLSLP establish a procedure to ensure that the transit of LNG carriers proceeding to Lévis be performed with the towing line of the escort tug secured to the stern of the LNG carrier from Pointe d'Alliance to the terminal.

16. The Committee recommends that Rabaska and the CLSLP establish a procedure for verifying meteorological conditions in the Chenal du Nord and at the terminal, and that the LNG carrier bound for the terminal does not enter the Chenal du Nord unless said conditions are consistent with the parameters set out in Appendix V.

17. Prior to the departure of the LNG carrier from the terminal, the Committee recommends that Rabaska and the CLSLP establish a procedure for verifying meteorological conditions in the Chenal du Nord, and that the LNG carrier gets underway only if conditions are consistent with the parameters set out in Appendix V.

18. To ensure safe passage under the Hydro-Québec lines at Beaumont, the Committee recommends that Rabaska implement a procedure for LNG carriers to confirm their air draught to the pilot.

19. The Committee recommends that TCMS review with Rabaska the transit criteria in the Chenal du Nord for the LNG carriers with self-supporting spherical type tanks before this type of vessels are authorised to visit the terminal in Lévis.

20. The Committee recommends that Rabaska and the CLSLP establish a procedure so that the passage of the Chenal du Nord by the LNG carrier be planned to avoid vessels meeting and overtaking between Pointe d'Alliance and the wharf at Saint-Jean, Île d'Orléans.

21. The Committee recommends that Rabaska and the CLSLP establish a procedure to coordinate the movements of LNG carriers with the deep-draught vessels in the Chenal du Nord.

22. The Committee recommends that Rabaska and the CLSLP establish a procedure to ensure that berthing manoeuvres are carried out only when visibility at the pier is at least one

nautical mile and sufficient to allow tug crew members and the ship's bridge team members to be in sight of one another at all times.

23. The Committee recommends that Rabaska and the CLSLP establish a procedure so that four tugs assist the LNG carrier during docking operations and that they be positioned alongside the LNG carrier prior to passing under the Hydro-Québec lines at Beaumont.

24. The Committee recommends that Rabaska and the CLSLP establish a procedure so that the tugs that assist the LNG carrier when departing from a terminal escort it beyond the Hydro-Québec lines at Beaumont.

25. In the event that an LNG carrier must depart the terminal with cargo on board, the Committee recommends that the passage of the Chenal du Nord be made with a tug escort.

26. The Committee recommends that Rabaska establish a procedure to log the meteorological conditions (wind, ice, precipitation and visibility) under which LNG carriers pass through the Chenal du Nord.

27. The Committee recommends that Rabaska establish a procedure to monitor and log meteorological conditions (wind, ice, precipitation and visibility) in the vicinity of the terminal.

28. The Committee recommends that Rabaska and the CLSLP establish a procedure to ensure, between Saint-Jean, Île d'Orléans and the terminal, vessels approach and overtake one another in such a way that:
    - the LNG carrier facilitates the overtaking of vessels that are following it prior to getting at the Hydro-Québec lines at Beaumont; and
    - the LNG carrier ensures that it does not impede the passage of nearby vessels prior to its swinging manoeuvres.

29. To not hinder LNG carrier approach and departure manoeuvres, the Committee recommends that the QPA make arrangements to control, during these manoeuvres, the movement of vessels between Pointe Martinière and the Hydro-Québec lines at Beaumont[21].

30. The Committee recommends that, when an LNG carrier is alongside the terminal, the QPA restrict the speed of vessels other than pleasure craft, so that:
    - upbound vessels be limited to a speed of 10 knots through the water, from one nautical mile downstream the terminal to a position where vessels are abeam the wharf; and
    - downbound vessels be limited to a speed of 6 knots through the water, from one nautical mile upstream from the terminal to a position where vessels are abeam the wharf.

Mooring procedures and provisions

31. Before ships in the 200,000 m^3 class are authorized by TCMS and the QPA to visit the terminal, the Committee recommends that Rabaska conduct simulations for passage through the Chenal du Nord and for docking manoeuvres and that it produce vessels' mooring and docking plans.

32. The Committee recommends that Rabaska establish a procedure to ensure that a safety tug remains on duty near the wharf when an LNG carrier is docked.

33. The Committee recommends that Rabaska put in place a control measure that guarantees that sufficient crew members remain aboard the LNG carriers throughout their stay at the terminal to carry out the ship's essential and emergency duties.

34. The Committee recommends that Rabaska and the QPA establish an approval procedure for all maintenance work that could affect operational readiness aboard an LNG carrier.

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[21] See the Nautical chart at Appendix XI.

Procedures in the Port of Québec

35. The Committee recommends that the QPA amend its port practices and procedures prior to the arrival of the first LNG carrier in order to include the practices and procedures stemming from the following recommendations:
    - Visibility criteria (recommendation 22);
    - Tug assistance (recommendations 23, 24, 32, 36 and 38);
    - Traffic management (recommendations 28, 29, 51, 52, 53 and 54);
    - Speed limits (recommendation 30); and
    - Operational readiness (recommendation 34).

Tug specifications

36. The Committee recommends that Rabaska arrange for and establish a procedure to ensure that tugs assisting the LNG carriers during docking manoeuvres each have a minimum bollard pull capacity of 50 tonnes[22].

37. The Committee recommends that Rabaska arrange for and establish a procedure to ensure that tugs used to escort the LNG carrier in the Chenal du Nord have a minimum bollard pull capacity of 80 tonnes and an escort tug endorsement from a classification society recognized by TCMS.

38. The Committee recommends that Rabaska make necessary arrangements so that the safety tug on duty has at least a bollard pull capacity of 80 tonnes and is at least equipped with class FIFI I[23] firefighting equipment with water spray system, approved by a classification society recognized by TCMS. To carry out this recommendation, Rabaska may use several tugs.

39. The Committee recommends that Rabaska establish a procedure so that the bollard pull capacity and the FIFI equipment on tugs assisting LNG carriers are inspected on an annual basis by an organization acceptable to TCMS.

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[22] For information, 1 metric ton of force = 9.81 kilo Newtons.
[23] Fire Fighting level 1.

LNG carrier specifications

40. The Committee recommends that TCMS put in place and maintain a specific inspection program for LNG carriers, similar to the existing first tanker visit program[24].

41. The Committee recommends that Rabaska establish a procedure to ensure that LNG carriers with the annotation "unmanned machinery space" maintain an engineering watch in the machinery compartment in the following situations:
    - at least one hour before arriving at a pilot station;
    - when the LNG carrier is in a compulsory pilotage area;
    - when the LNG carrier is in ice-infested waters; and
    - during transhipment of cargo.

42. The Committee recommends that Rabaska establish a procedure to ensure that both steering gear power units on LNG carriers are in operation:
    - at least one hour before arriving at a pilot station; and
    - when the LNG carrier is in a compulsory pilotage area.

43. The Committee recommends that Rabaska establish a procedure to ensure that LNG carriers simultaneously use a sufficient number of motor alternators capable of handling, without interruption, the vessel's electrical load in the event that one of the motor alternators breaks down and this:
    - at least one hour before arriving at the Les Escoumins pilot station;
    - when the LNG carrier is in a compulsory pilotage area; and
    - when the LNG carrier is in ice-infested waters.

44. The Committee recommends that Rabaska ensure that the LNG carrier's propulsion engines that are equipped with a load control program include and use a program adapted to cold

[24] Under this policy, foreign oil tankers are inspected at the time of their first visit to a Canadian port, then annually.

climates and to severe ice conditions to make it possible to immediately use full engine power at all times.

45. The Committee recommends that Rabaska provide TCMS with the description and layout of the aft mooring equipment of the LNG carriers that will be used by the escort tug as well as an endorsement from an organization acceptable to TCMS confirming that they are appropriate for this type of operation. The Committee also recommends that these descriptions and endorsements be disclosed to TCMS before any LNG carriers enter Canadian waters.

Site plans and technical data

46. The Committee recommends that Rabaska perform a bathymetric survey, in accordance with Canadian Hydrographic Service (CHS) and Transport Canada Navigable Water Protection Act (TC- NWPA) standards and requirements, immediately upon completion of the works, in the area bound by the following geographic coordinates:[25]

    - Point 1, 46°50'00'' N, 071°05'36'' W
    - Point 2, 46°50'39'' N, 071°05'36'' W
    - Point 3, 46°50'48'' N, 071°04'00'' W
    - Point 4, 46°50'03'' N, 071°04'00'' W
    - Point 5, 46°49'57'' N, 071°05'00'' W

    Rabaska shall communicate the survey results to the CHS and TC- NWPA at least six months prior to the arrival of the first ship.

47. The Committee recommends that Rabaska meet with CHS, at least 30 months prior to the arrival of the first LNG carrier to the terminal, in order to establish the marine cartography needs and particular agreements of realization.

48. The Committee recommends that TCMS, in conjunction with the relevant responsible organizations, draft the notices required regarding the following recommendations:

    - Boarding of ice advisers (recommendation 8);

[25] See Appendix VI.

- Approach to Les Escoumins (recommendation 10);
- Anchorage sites (recommendation 13);
- The Île-aux-Coudres passage (recommendation 14);
- The Chenal du Nord passage (recommendations 15, 20 and 21);
- Movement of vessels in the Port of Quebec (recommendations 28, 29 and 30);
- Movement of vessels in the vicinity of the terminal (recommendations 51, 52, 53 and 54); and
- Communications (recommendation 60).

49. The Committee recommends that TCMS make the necessary arrangements to integrate the notices required in recommendation 48 into the appropriate official publications.

50. The Committee recommends that the CHS take the following elements into account when updating nautical charts and publications:
    - The addition of all suitable marine infrastructures;
    - The addition of relevant information (aids to navigation and others);
    - Anchorages likely to be used by LNG carriers;
    - Any obstructions to navigation identified in the bathymetric survey conducted upon the completion of work on the terminal; and
    - Notices and warnings pertaining to the presence of LNG carriers, as required and prepared by government authorities.

    Rabaska shall communicate the above elements to the CHS and TC at least 12 months prior to the arrival of the first ship to the terminal.

51. Subject to recommendation 53, the Committee recommends that Rabaska take the steps necessary to notify small vessel traffic to keep clear of the marine terminal.

52. The Committee recommends that Rabaska take the steps necessary to forbid the passage of small vessel traffic beneath the trestle bridge between the pier and the shore when the LNG carrier is docked.

53. The Committee recommends that Rabaska draft the appropriate measures to allow the controlled and safe passage of small vessel traffic other than motorized or sail boats under the trestle bridge between the pier and the shore when no LNG carriers are alongside the terminal.

54. The Committee recommends that the QPA restrict the anchorage of any vessel at less than 500 m of the marine terminal.

55. In the event of a disruption in marine terminal operations, the Committee recommends that Rabaska take the necessary steps to maintain its marine equipment and infrastructure to ensure the safety of navigation and mariners.

56. The Committee recommends that Rabaska establish, prior to the start of terminal operations, an annual audit system to be executed by firms acceptable by the federal authorities and focusing on marine terminal equipment and operating procedures. The Committee further recommends that a record of these audits be kept.

Transhipment of cargo

57. The Committee recommends that Rabaska establish a control measure to ensure that personnel assigned to transhipment operations is not assigned to other tasks at the same time.

58. The Committee recommends that Rabaska incorporate into its safety and operating measures the applicable principles set out in the following publications:
    - *International Safety Guide for Oil Tankers and Terminals*; and
    - *Liquefied Gas Handling Principles on Ships and in Terminal*.

59. The Committee recommends that Rabaska incorporate into its procedures regarding operations between LNG carriers and the terminal the safety checklists described in the publication entitled *Liquefied Gas Handling Principles on Ships and in Terminals*.

60. The Committee recommends that Rabaska establish a procedure to maintain a permanent communication system between responsible officers aboard the LNG carrier and those responsible for the LNG terminal and the assigned tugs.

61. The Committee recommends that Rabaska establish a procedure so that a continuous radio watch, on the appropriate VTS sector channel be maintained during the transhipment operations, by a qualified person aboard the LNG carrier and the safety tug.

Port Information Book, Terminal Operations Manual and Ship Safety Management Manual

62. The Committee recommends that Rabaska submit to the TCMS for review, at least six months prior to the start of operations, the Port Information Book and Terminal Operations Manual.

63. The Committee recommends that Rabaska make the Port Information Book and Terminal Operations Manual available in both of Canada's official languages.

64. The Committee recommends that Rabaska establish a procedure so that LNG carriers bound for Lévis receive the Port Information Book and Terminal Operations Manual prior to their entry into Canadian waters.

65. The Committee recommends that Rabaska ensure that the Port Information Book include the measures and information contained in recommendations on:
    - Communications (recommendations 5 and 60);
    - Ice advisers (recommendations 7, 8 and 9);
    - Traffic management at the pilot station (recommendation 10);
    - Transit criteria (recommendations 11, 14, 16, 17, 18, 20, 21 and 28);
    - Use of tugs (recommendations 15, 23, 24, 25, 36 and 37); and
    - Docking manoeuvre procedures (recommendation 22).

66. The Committee recommends that Rabaska produce a table describing all the limiting conditions of operations, as described in the studies submitted for LNG carrier departures and

arrivals, and that Rabaska incorporate this table into the Port Information Book. At minimum, this table should include the following elements:

- Meteorological factors;
- Mooring lines and bollards load limits;
- Maximum lateral approach speed; and
- Number of tugs required and their bollard pull capacities.

67. The Committee recommends that Rabaska ensure that the Terminal Operations Manual include the measures pertaining to the recommendations on:
    - Communications (recommendations 5, 60 and 61);
    - Manning (recommendation 33);
    - Port operations (recommendations 34, 57, 58 and 59);
    - Safety tugs (recommendations 32 and 38); and
    - Nearby marine traffic (recommendations 51, 52 and 54).

68. The Committee recommends that Rabaska produce a table describing situations that could require the interruption of transhipping operations and integrate the table into the Terminal Operations Manual.

69. The Committee recommends that Rabaska ensure that the ship Safety Management Manual include the information pertaining to the recommendations on:
    - Ice advisers (recommendations 7, 8 and 9);
    - Traffic management at the pilot station (recommendation 10);
    - Manning (recommendation 33);
    - Navigation (recommendations 11, 14, 16, 17, 18, 20, 21, 22 and 28);
    - Use of tugs (recommendations 15, 23, 24, 25, 36 and 37);
    - Port operation procedures (recommendations 33, 34, 57, 58, 59 and 61); and
    - Engine room operations (recommendations 41, 42 and 43).

70. The Committee recommends that Rabaska submit to the TCMS for review, at least six months prior to the start of operations, a document containing the safety management elements set out in recommendation 69.

71. The Committee recommends that Rabaska ensure that the relevant provisions of the Port Information Book and the Terminal Operations Manual be taken into account into the Safety Management Manual of LNG carriers calling into the marine terminal.

Training

72. The Committee recommends that Rabaska, in conjunction with those responsible for the fleet of tugs, develop a training program that takes into account the training criteria set out in standards CSA Z276-01 and NFPA 59A concerning:

    - Dangers associated with the transportation and handling of cryogenic cargo;
    - Emergency situations, firefighting, etc.; and
    - The equipment specific to each tug.

    The Committee further recommends that tug crew members receive this training before they are assigned to work on tugs assisting LNG carriers.

73. The Committee recommends that Rabaska, in conjunction with those responsible for the fleet of tugs and the CLSLP, develop a training program on indirect mode escort tug towing techniques. The Committee further recommends that marine personnel involved receive this training before they are assigned to LNG carrier escort operations.

74. The Committee recommends that Rabaska develop, implement and maintain, in accordance with standards CSA Z276-01 and NFPA 59A, a training program for all individuals working at the marine terminal.

Emergency response plan

75. The Committee recommends that Rabaska submit to the QPA, TCMS and EC the emergency plan for the LNG marine terminal for review at least six months prior to the start of operations.

76. The Committee recommends that TCMS, the QPA and the CCG participate in the work of the joint municipal-industry committee (CMMI) as it relates to the marine terminal emergency plan.

REMARKS

This report, produced by the TRC, should not be considered as a policy statement or deemed to have complete or partial government support. The report merely constitutes the considered opinion of the representatives of various departments and agencies who reviewed the proponent's proposals and drafted the report.

The TRC's analysis took into consideration the present marine context as well as the information, documentation and technologies available at the time the report was written. Some aspects of the project may need to be re-evaluated if warranted by the marine context in future or if the start of terminal operations, and consequently the arrival of the first ships, is substantially delayed.

This report was produced specifically in connection with the LNG terminal project at Lévis as proposed by Rabaska. Because each project assessed under the TRP is analyzed on the basis of studies provided by the proponent, this report cannot be applied to other projects.

The implementation of the report's recommendations is the responsibility of the departmental officials responsible for regulation or of the proponent, as the case may be. Therefore, the recommendations in this report may invite the participation of many organizations according to their respective areas of expertise and the legislation they are responsible for enforcing.

APPENDIX I – TRC MEMBERS

Name	Organization and Title	Roles	Areas of Competency
Michel Boulianne	TCMS (Québec city) Cargoes and Pollution Prevention Division Manager	Chair Drafting Committee	• Master • Navigation • Navigation safety • Safe transportation of cargo • Inspection and certification of ships • Certification of mariners • Marine safety policies and legislation
Danielle Duranceau	TCMS (Québec city) Cargoes and Pollution Prevention Division Marine Surveyor	Coordinator Drafting Committee	• Master • Navigation • Inspection and certification of ships • Certification of mariners • Marine safety policies and legislation
Mario Lavoie	TCMS (Rimouski) Marine Surveyor	Member Drafting Committee	• Master • Navigation • Inspection and certification of ships • Certification of mariners • Marine safety policies and legislation
Luc Charbonneau	TCMS (Québec city)	Member	• Marine Engineering Mechanic 1st Class • Engine room operations and management • Inspection and certification of ships • Certification of mariners • Marine safety policies and legislation
Marcellin Papillon	TCMS (Québec city) Technical Division Manager	Member	• Marine Engineering Mechanic 1st Class • Technical knowledge • Ship building and equipment • Minimum safe manning • Inspection and certification of ships • Certification of mariners
Jan Zwaan	TCMS (Ottawa) Cargoes and Ship Port Interfaces Manager	Resource person	• Master • Safe transportation of cargo • Marine safety policies and legislation

Name	Organization and Title	Roles	Areas of Competency
Robert Turner	TCMS (Ottawa) Navigation Safety and Radio Communications Manager	Resource person	• Master • Navigation safety • Marine safety policies and legislation
Michel Demers	Transport Canada Navigable Waters Protection Manager	Member	• Navigable Waters Protection Act
Richard Jones	TC – Navigable Waters Protection Navigable Waters Protection Officer	Member	• Navigable Waters Protection Act
Pierre Laframboise	TC – Navigable Waters Protection (Ottawa) Navigable Waters Protection Officer	Resource person	• Navigable Waters Protection Act
Daniel Morin	TC – Transportation Security and Emergency Preparedness (Québec city) Regional Inspector	Member	• Marine Transportation Security Act • ISPS
Lucie Pagé	TC – Environmental Affairs Senior environmental officer	Member	• Canadian Environmental Protection Act • Liaison with CEAA and Joint Commission
Richard Sanfaçon	CHS Hydrographical Data Acquisition Manager	Member	• Bathymetry • Nautical charts and publications • Current, tide and water level
Martin Blouin	CCG Environmental Response Supervisor	Member Drafting Committee	• Master • Navigation • Ice navigation • Liaison with: – MCTS – Icebreaking Services – Navigable Waterways – Environmental Response – Search and Rescue – Aids to navigation

Name	Organization and Title	Roles	Areas of Competency
Phil Lightfoot	Natural Resources Canada Canadian Explosives Research Laboratory Manager	Member	• Risk analysis
Bert Von Rosen	Natural Resources Canada Canadian Explosives Research Laboratory	Member	• Risk analysis
Louis Breton	Environment Canada Environmental Assessment Analyst	Member	• Canadian environmental policies and legislation
Robert Reiss	Environment Canada Environmental Emergencies Emergency Responder	Resource person	• Canadian environmental policies and legislation
Michel Petit	Québec Harbour Harbour Master	Member	• Port Authority • Port Services
Denys Pouliot	LPA Director of Operations	Member	• Master • Pilotage Act • Management of pilotage services
Simon Pelletier	CLSLP	Member	• Master • CLSLP Class A pilot • Pilotage • Navigation • Knowledge of the waterway (Les Escoumins – Québec City) • Shiphandling
Sylvain Desgagnés	Ice Adviser	Resource person	• Master • Ice adviser • Harbour pilot • Winter navigation in the Gulf • Shiphandling
Claude Ferland	Civil Protection Capitale Nationale, Chaudières-Appalaches and Nunavik Regional Director	Resource person	• Quebec civil protection policies and legislation
Romain St-Cyr	Civil Protection	Resource person	• Quebec civil protection policies and legislation

Name	Organization and Title	Roles	Areas of Competency
Pierre Michon	Quebec Department of Sustainable Development, Environment and Parks Coordinator, Watercourse and Water Body Development Projects Water Projects Service Environmental Assessments Branch	Resource person	• Quebec environmental policies and legislation
Pierre Chebou	Québec Department of Transportation	Resource person	• Québec transportation policies and legislation

APPENDIX II – KEY STAGES OF TERMPOL PROCESS

Chronology of key stages in the TERMPOL process															
	2004			2005			2006			2007					
	July	November	December	November			October			January	February	March	April	May	
Letter from the proponent requesting the initiation of the review process	30														
Meeting with the proponent to establish the operating terms and conditions of the review process			07												
Submission of required studies by the proponent				24											
Review of studies and documents by the TRC			→	→	→	→	→	→	→	→	→				
Communications with, questions and requests for clarification to the proponent			→	→	→	→	→	→	→	→	→				
Drafting of report							→	→	→	→	→	→			
Revision, feedback and translation										→	→	→	→		
Publication of the review report														•	

APPENDIX III – DESIGN SHIP

The following table shows the main specifications of the designed ships used by the proponent.

Ships considered	LNG Carrier	Manoeuvring Simulations	
Cargo capacity	153 500 m³	135 477 m³	138 000 m³
Cargo Containment	Prismatic membrane tanks	Spherical tanks	Prismatic membrane tanks
Length overall (m)	289,60	293,00	277,00
Beam (m)	43,35	45,75	43,4
Depth to main deck (m)	26,25	25,00	26,00
Ballast condition draft (m)	9,70	N/A	N/A
Maximum draft (m)	11,60	11,25	11.5
Ballast condition air draft (m)	40,20	53,00[26]	41,20
Displacement (t)	106 000	101 800	100 800
Gross Register Tonnage (UMS)	97 000	110 895	93 786
Cargo Discharge Rate	12 000m³/h	N/A	N/A
Propulsion	Diesel gas electric	Steam Turbines	Steam Turbines
Shaft power	27 500 kW	28 698 kW	23 834 kW
Service speed	19,9 knots	20,5 knots	19,5 knots

The terminal is being designed to accept LNG carriers ranging from 65 000 m3 to 216 000 m3.

For the purpose of risk assessment, the proponent considered LNG carriers of 160 000 m3 and 216 000 m3.

For manoeuvring simulations, a spherical tank LNG carrier of 135 477 m3 and a membrane prismatic tank LNG carrier of 138 000 m3 were used.

[26] For the spherical tanks LNG carrier of 145 000 m³ described in the proponent initial demand for the TERMPOL process.

APPENDIX IV – SURVEYS AND STUDIES FROM THE TERMPOL CODE RETAINED BY THE TRC

3.2 Origin, Destination and Marine Traffic Volume Survey

3.3 Fishery Resources Survey

3.4 Offshore Exercise and Offshore Exploration and Exploitation Activities Survey

3.5 Route Analysis, Approach Characteristics and Navigability Survey

3.6 Special Underkeel Clearance Survey

3.7 Transit Time and Delay Survey

3.8 Casualty Data Survey

3.9 Ship Specification

3.10 Site Plans and Technical Data

3.11 Cargo Transfer and Transhipment System

3.12 Channel, Manoeuvring and Anchorage Elements

3.13 Berth Procedures and Provisions

3.15 General Risk Analysis and Intended Methods of Reducing Risks

3.16 Port Information Book

3.17 Terminal Operations Manual

3.18 Contingency Planning

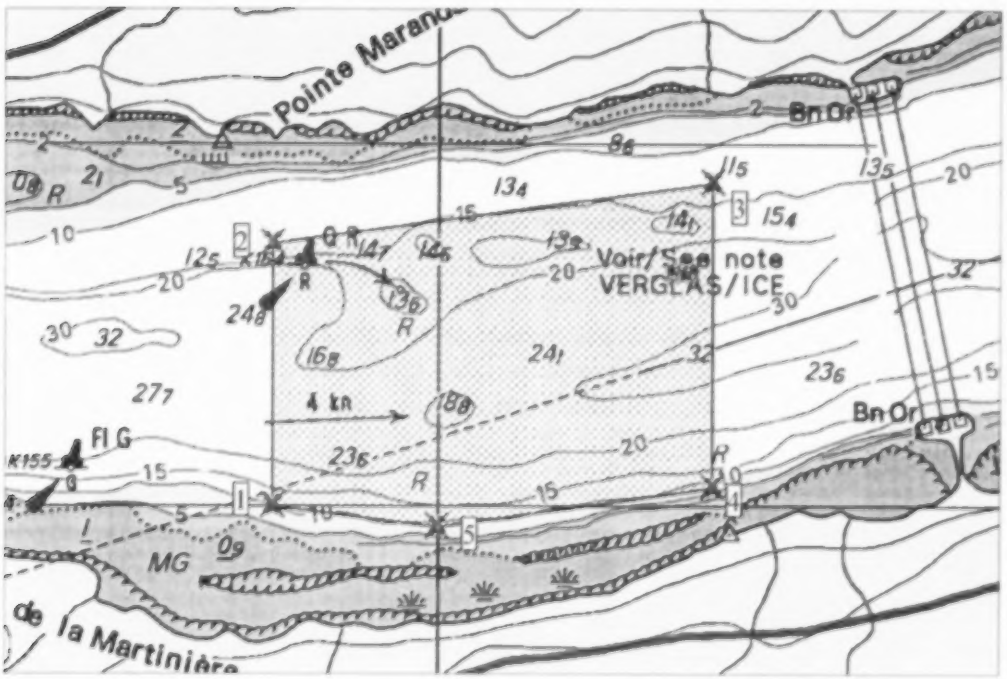
APPENDIX V – OPERATION THRESHOLD CRITERIA[27]

Activity	Wind Speed (knots)	Visibility (nautical mile)
Berthing	≤ 25	≥ 1
Unberthing	≤ 25	≥ 1
Chenal du Nord passage – Membrane tanks LNG carrier	< 35	≥ 5
Interruption of unloading operations	≥ 35	N/A
Unloading arms disconnection	≥ 40	N/A
Resumption of unloading operations	< 35	N/A

[27] See recommendations 16 and 17.

APPENDIX VI – BATHYMETRIC SURVEY AREA[28]

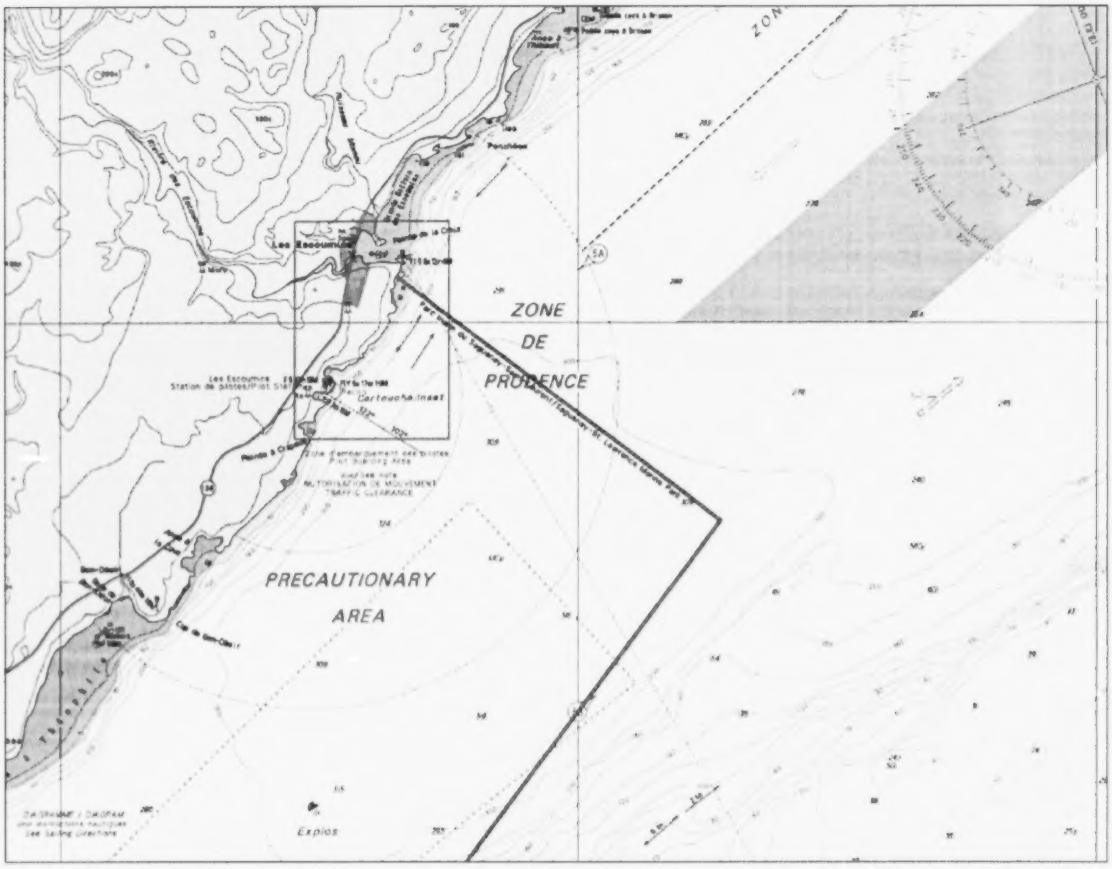
Name	Latitude	Longitude
Point 1	46°50'00" N	071°05'36" W
Point 2	46°50'39" N	071°05'36" W
Point 3	46°50'48" N	071°04'00" W
Point 4	46°50'03" N	071°04'00" W
Point 5	46°49'57" N	071°05'00" W



Source: Extract from the nautical chart 1317 produced by the Canadian Hydrographic Service, Fisheries and Oceans Canada.

[28] See recommendation 46.

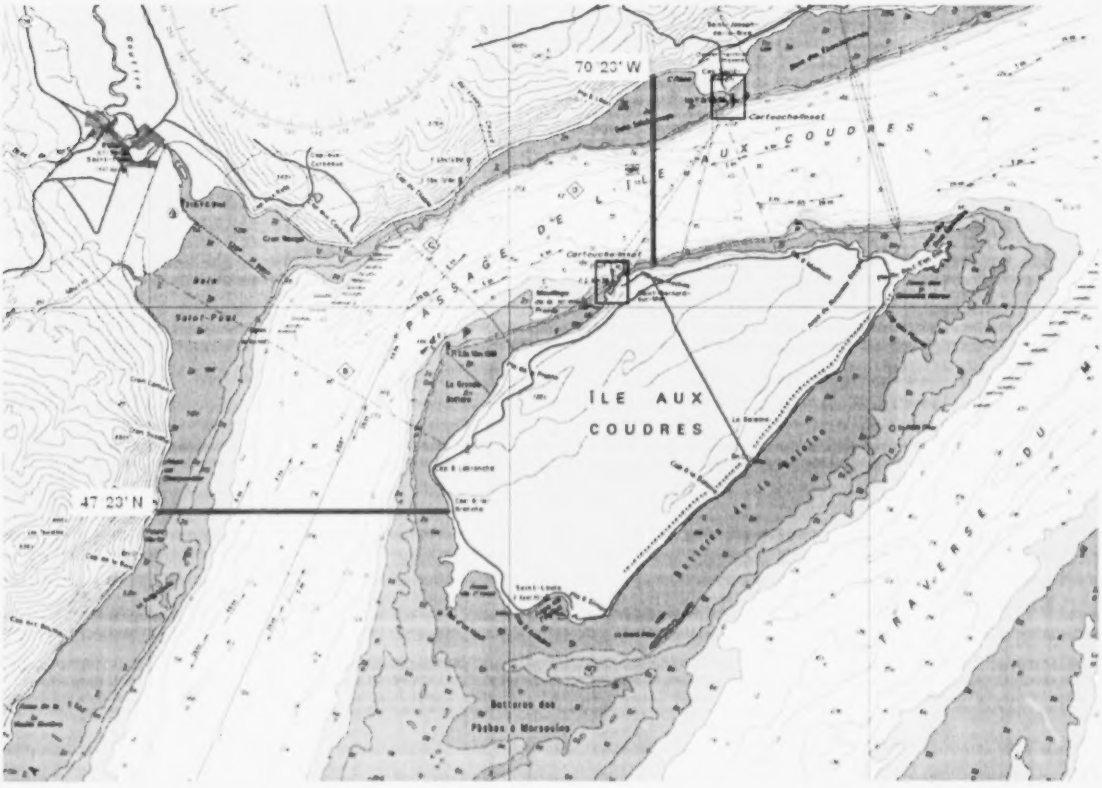
APPENDIX VII – NAUTICAL CHART – LES ESCOUMINS AREA[29]



Source: Extract from the nautical chart 1235 produced by the Canadian Hydrographic Service, Fisheries and Oceans Canada.

[29] See recommendation 10.

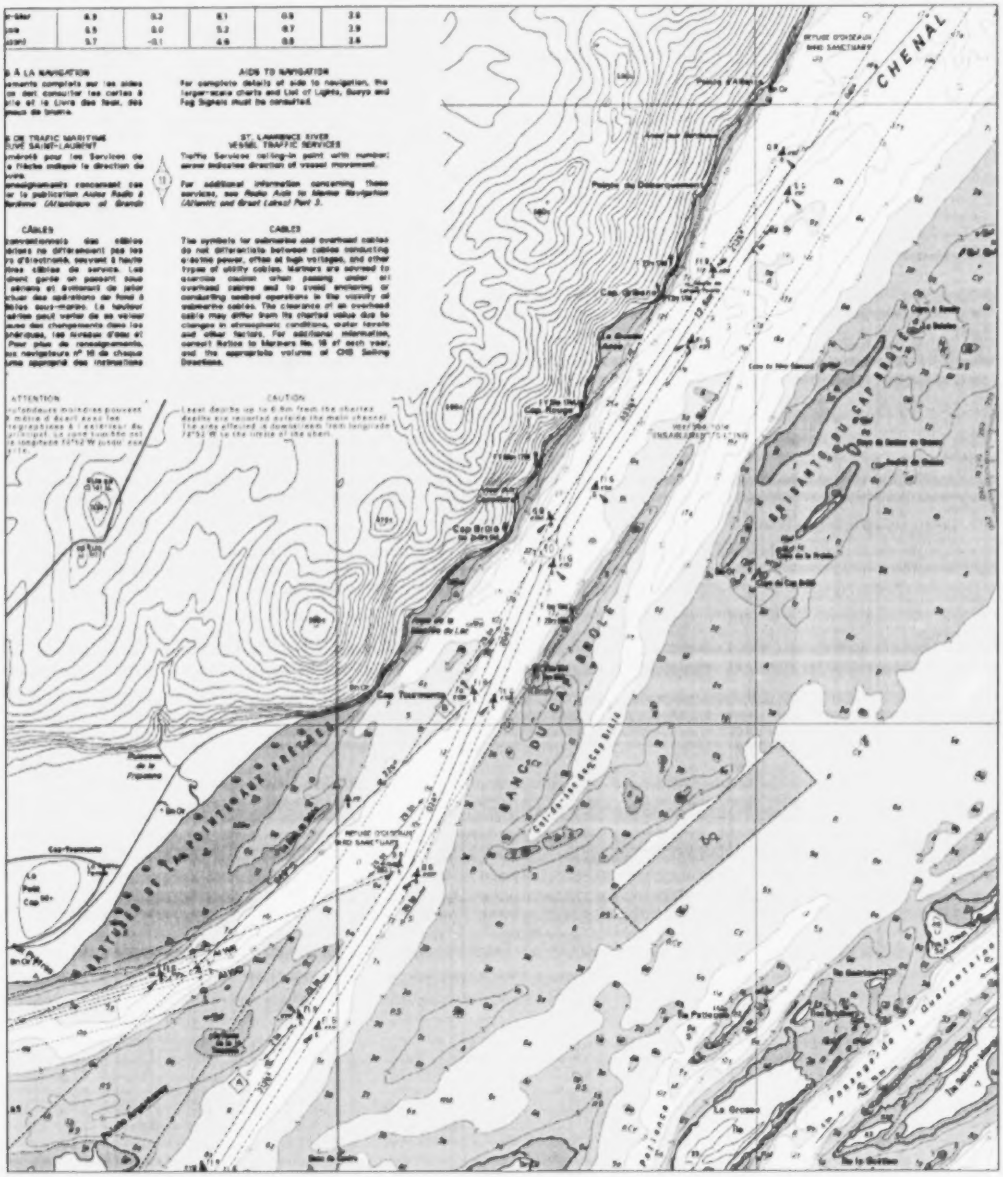
APPENDIX VIII – NAUTICAL CHART – ILE-AUX-COUDRES AREA[30]



Source: Extract from the nautical chart 1233 produced by the Canadian Hydrographic Service, Fisheries and Oceans Canada.

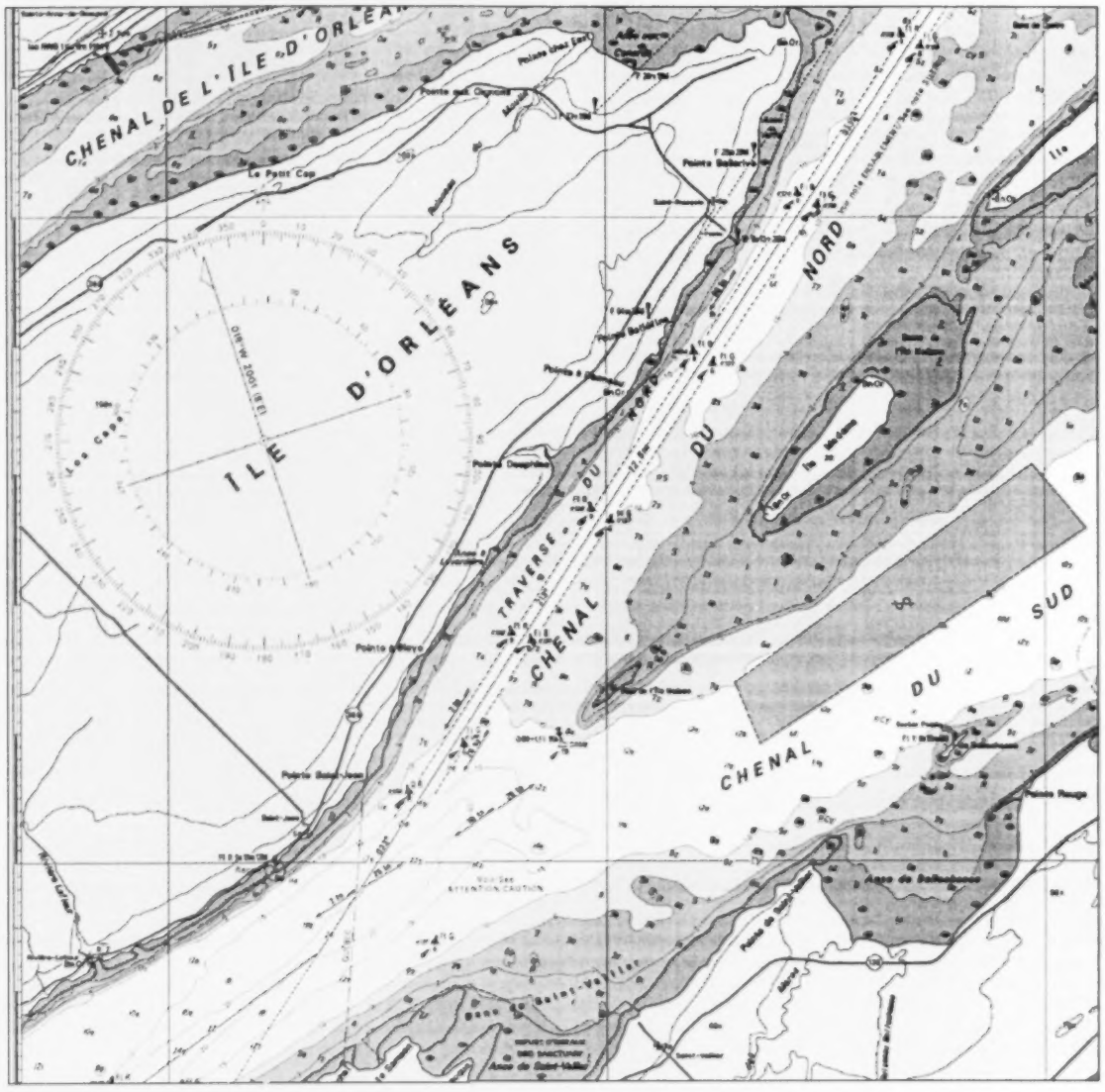
[30] See Recommendation 14.

APPENDIX IX – NAUTICAL CHART – CHENAL DU NORD NORTH AREA



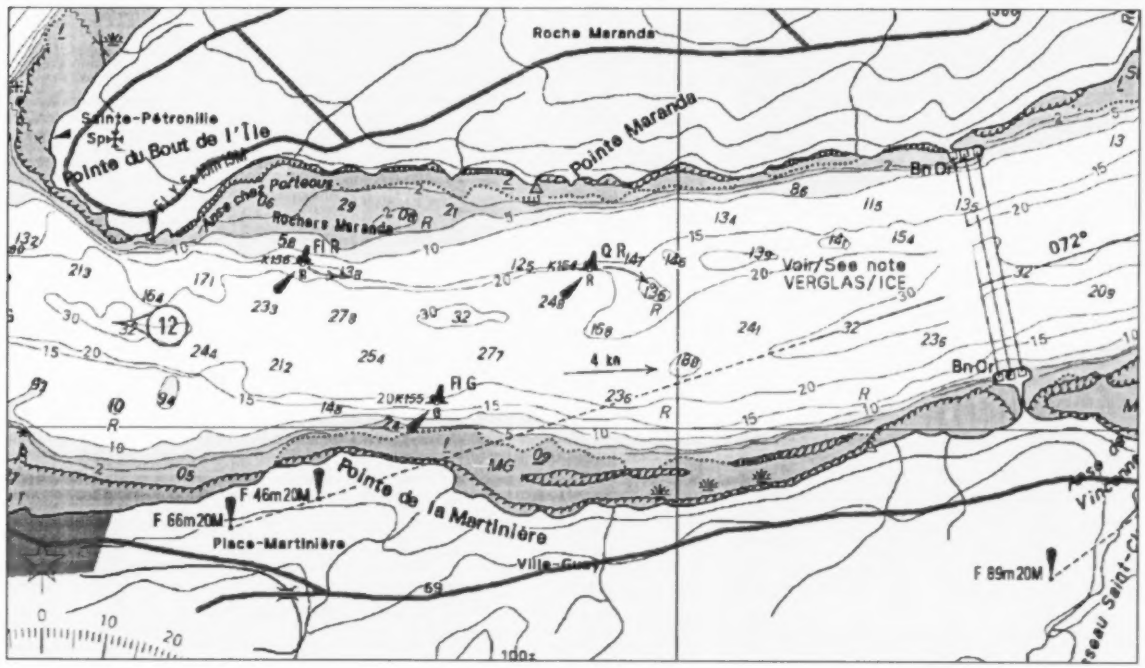
Source: Extract from the nautical chart 1317 produced by the Canadian Hydrographic Service, Fisheries and Oceans Canada.

APPENDIX X – NAUTICAL CHART – CHENAL DU NORD SOUTH AREA



Source: Extract from the nautical chart 1317 produced by the Canadian Hydrographic Service, Fisheries and Oceans Canada.

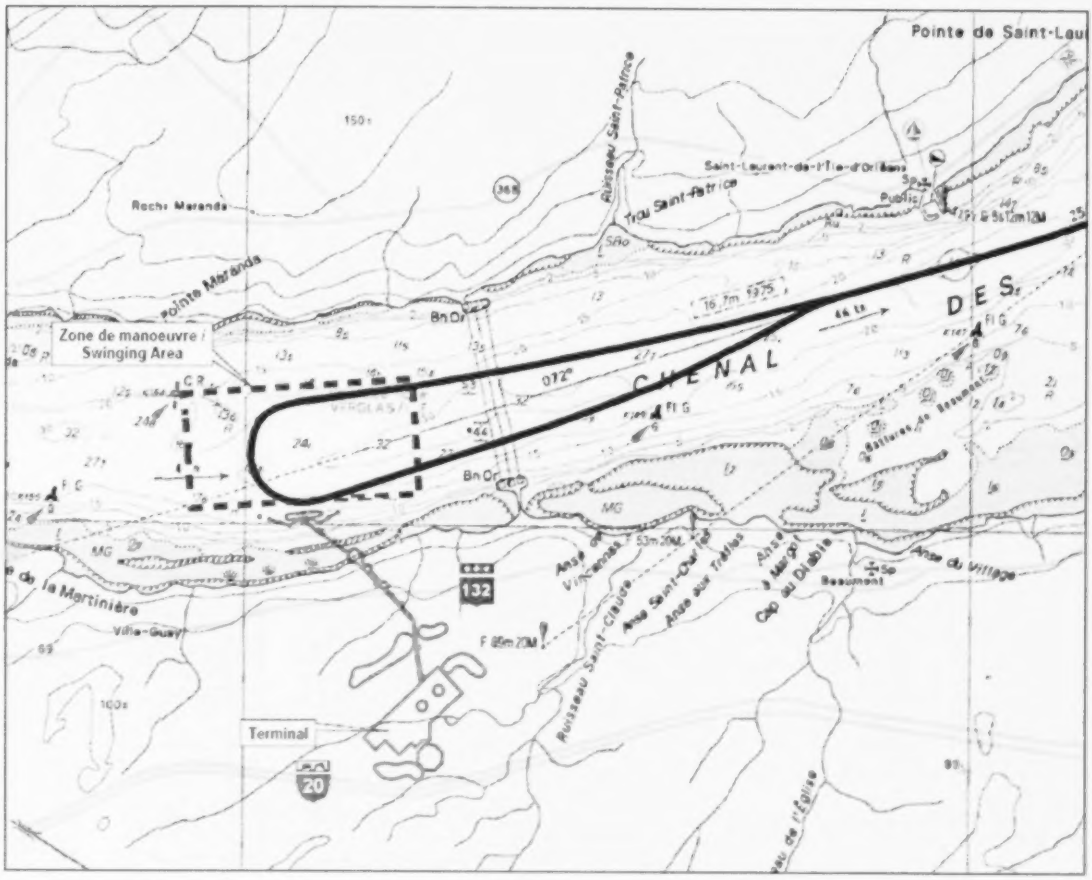
APPENDIX XI – NAUTICAL CHART – TERMINAL AREA[31]



Source: Extract from the nautical chart 1317 produced by the Canadian Hydrographic Service, Fisheries and Oceans Canada.

[31] See recommendation 29.

APPENDIX XII – PROPOSED LOCATION OF THE RABASKA MARINE TERMINAL



Source: Documentation submitted by the proponent to the joint review panel: Terminal méthanier, Tome 3, Volume 2, Appendix A - 4.3

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